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Original Article

Original ArticleTrehalose Activates Autophagy and Prevents Hydrogen Peroxide-Induced Apoptosis in the Bone Marrow Stromal Cell

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Abstract

Bone marrow stromal stem cells (BMSCs) play a significant role in cell therapy. These cells quickly die after transplantation to the affected area due to oxidative stress. The natural disaccharide, trehalose which can be known as autophagy inducer. The present study aimed to investigate the role of trehalose in preventing BMSCs from oxidative stress caused by H_2O_2.BMSCs were isolated from the adult rats. The cells were divided into three groups: (a) control; (b) 100 µM H_2O_2; (c) 100 µM H_2O_2 and trehalose 3%. The morality rate was analyzed by viability test. Immunocytochemistry and Western blot was used in order to evaluate p62 protein and LC3II/LC3I ratio, respectively. In order to evaluate apoptosis, cleaved caspase-3 protein was used. In viability test, the survival rate for BMSCs after 8 h were 82%, 72%, 49%, and 39% (for groups who received 50, 100, 200, and 400 µM H_2O_2, respectively) compared to the control group. Pre-treatment with the use of trehalose 3% increased cell survivals. The levels of p62 protein, were increased in the cells under H_2O_2 treatment, while the levels of p62 protein in the cytoplasm, as autophagy inclusions, reduced for the group with trehalose pre-treatment. In addition, trehalose caused to increase LC3II/LC3I ratio and decreased the expression of cleaved caspase-3.Trehalose decreased apoptosis and increased the autophagy and survival levels of the cells against H_2O_2. Due to the unique properties of trehalose and its low toxicity, it can be used as a pharmaceutical agent in cellular transplantation to reduce oxidative stress.

Keywords: Stress oxidative; Autophagy; Apoptosis; Bone marrow stromal cells; Trehalose